TELECOMMUNICATIONS & TELEMATICS FOR TRANSPORTS LABORATORY

Telecommunications & Telematics for Transports Lab.

TEST REPORT

Ref. No. ARSK00079/2

Date: 2010-04-16

Measurements performed in accordance with:

FCC Rules: Code of Federal Regulations (CFR) no. 47 - PART 15 – RADIO FREQUENCY DEVICES

PRODUCT	: RADIOCONTROL	
TESTED MODEL	: DUAL BAND	
APPLICANT	: MICRO DEVICE S.r.l. – Via Bellini, 31/33 –I- 20095 Cusano Milanino (MI)	
MANUFACTURER	: MICRO DEVICE S.r.l. – Via Bellini, 31/33 –I- 20095 Cusano Milanino (MI)	
TRADEMARK	: MICRO DEVICE	
OTHER INFORMATION	Sample received on	: 2010-03-31 (sample sent by applicant)
	Testing dates	: 2010-03-31÷2010-04-15 IMQ BEM: 53784
	Tested samples No.	: 1
	Testing Laboratory	: IMQ S.p.A. Via Quintiliano, 43 I-20138 MILANO

Tested by :	R. Radice	Signature:	Roberto Radice	Date :	2010-04-16
Checked by:	R. Colombo (Lab. Deputy)	Signature:	Roberto Colombo	Date :	2010-04-16

Revision Sheet

Release No.	Date	Revision Description
Rev. 0	2010-04-16	Test Results and Evaluation Report

CONTENTS

1 TEST SPECIFICATIONS, METHODS & PROCEDURES

The following tests and relevant standards have been applied to the Equipment Under Test (EUT):

1.1 EMISSION TESTS

Product family standard	Date	Title
FCC Rules	10-01-2009	Code of Federal Regulations (CFR) no. 47 PART 15 – RADIO FREQUENCY DEVICES

1.2 EQUIPMENT CLASSIFICATION

According to the definition 15.3 (o) EUT is a Class B digital device. A digital device that is marketed for use in a residential environment notwithstanding use in commercial, business and industrial environments. Examples of such devices include, but are not limited to, personal computers, calculators, and similar electronic devices that are marketed for use by the general public. Note: The responsible party may also qualify a device intended to be marketed in a commercial, business or industrial environment as a Class B device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B digital device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B digital device, regardless of its intended use so it shall fulfil provisions of **47CFR Part 15 Subpart B – Unintentional radiators** – Section 15.107 and 15.109.

1.3 ENVIRONMENTAL CONDITIONS

TEST CONDITIONS	MEASURED
Ambient Temperature	20 ÷ 25 °C
Relative Humidity	50 ÷ 60 %
Atmospheric Pressure	900 ÷ 1000 mbar

2 EQUIPMENT UNDER TEST DETAILS

2.1 EUT IDENTIFICATION

The EUT is composed by the following modules/parts:	Radiocontrol, composed by: ▪ Internal Radio receiver module AUR.EL at 433,92 MHz RX-AM4SF & receiver module AUR.EL at 868,30 MHz mod. RX-AM8SF ▪ Power input board, with microprocessor at 16 MHz ▪ Engine output board with 4 MHz quartz ▪ Bow thruster output board with 4 MHz quartz ▪ Stern thruster output board with 4 MHz quartz ▪ Anchor winch output board with 4 MHz quartz
EUT classification	▪ Unintentional radiator
EUT use / installation (fixed/vehicular use/portable use) :	▪ Vehicular use (nautical)
EUT single or system:	▪ Single
EUT standing (floor-standing/Table-top-wall-mounted) :	▪ Table
Dimension of EUT (H x W x D):	▪ 175 x 170 x 130 mm.

2.2 FEATURE OF EQUIPMENT UNDER TEST

Power specification:	▪ 12÷24 V dc
Consumption:	▪ Max. 2 W
Antenna:	▪ Integrated Antenna (wire < 17cm.) 433,92 MHz ▪ Integrated Antenna (wire < 10cm.) 868,30 MHz
Microprocessor:	▪ Microchip mod. PIC18LF6720/6722
Quartz:	▪ N°4 at 4 MHz ▪ N°1 at 16 MHz
Main SW identification	▪ /
Main HW Board identification	▪ /
Peripherals included (for system application)	▪ None
Interfaces :	▪ None
Integrated interfaces :	▪ None
AC adapter:	▪ None

2.3 RECEIVER MODULE TECHNICAL DATA

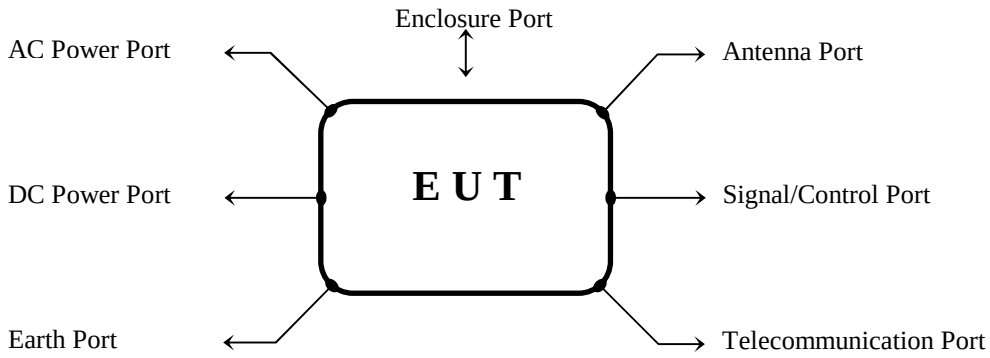
433,92 MHz RECEIVER Parameters	Value
Supply Voltage :	▪ 4,75÷5,25 V (typ. 5 V)
Number of RF channels :	▪ Wideband
Receiving frequency :	▪ 433,92 MHz
Assigned frequency band :	▪ 433,05÷434,79 MHz
Sensitivity :	▪ Declared -109 dBm
Antenna :	▪ Integrated Antenna (wire < 17cm.)
Extreme operating conditions :	▪ Declared -20°÷+80℃

868,30 MHz RECEIVER Parameters	Value
Supply Voltage :	▪ 4,5÷5,5 V (typ. 5 V)
Number of RF channels :	▪ Wideband
Receiving frequency :	▪ 868,30 MHz
Assigned frequency band :	▪ 868,00÷868,60 MHz
Sensitivity :	▪ Declared -108 dBm
Antenna :	▪ Integrated Antenna (wire < 17cm.)
Extreme operating conditions :	▪ Declared -20°÷+80℃

2.4 TESTED SAMPLES

SAMPLE Nr.	Part number
1	/

2.5 SYSTEM INTERFACE IDENTIFICATION



#	Interface	Description	Maximum length	Ref. Document
1	Enclosure	Plastic enclosure	----	----
2	AC Power port	Port not present	----	----
3	DC Power port	RX: external supply 12÷24 V dc	< 3 m.	----
4	Signal / control port	N°5 Outputs command	< 3 m.	----

2.6 DESCRIPTION OF SUPPORT EQUIPMENT

Here following the details concerning equipment needed for correct operation or loading of the EUT, but not considered as part of equipment under test :

EQUIPMENT	MANUFACTURER	MODEL
Radiocontrol (transmitter unit)	MICRO DEVICE	DUAL BAND
It has been used only for to control the correct working of receiver unit.		

3 GENERAL MEASUREMENT CONDITIONS

Unless special conditions specified in the present test report, EUT configuration and general measurement conditions used are based on requirements of ANSI C63.4-2003 and CISPR Pub. 22:1997.

3.1 OPERATION OF THE EQUIPMENT (EUT)

The operational condition of the EUT was determined by the manufacturer according to the typical use of the EUT with respect to the expected highest level of emission.

These operational modes are described in the following table:

Ref.	Description
#1	Rx operating at 433,92 & 868,30 MHz at same time (continuous reception mode) – N°1 Output active

4 SUMMARY OF TEST RESULTS

4.1 Emission tests

CFR47 Part 15 Subpart B Section:	Title	Port	Operating condition	Result	Test details
15.107	Conducted emission	AC power supply	Not applicable: the equipment is always supplied by a vehicular battery		
15.109	Radiated emission	Enclosure	#1	Within the limit	1

REMARK: Detail of the result are showed on the next pages.
Test uncertainties are in accordance with document IO-80-U01.

4.2 METHODS OF MEASUREMENT

All compliance measurements have been carried out using the procedures described in the standard ANSI C63.4-2003 (excluding sub-par. 4.1.5.2, 5.7 9 and 14) and Section 15.31 of CFR47 Part 15 – Subpart A (General).

Additional test requirements have been adopted according to the reference Section indicated in the Test Table

4.3 FREQUENCY RANGE INVESTIGATED

a. Radiated emission tests : from 30 MHz to 10° har monic of highest working frequency of equipment under test

5 EMC TEST DATA

TEST No. 1	Title "Radiated disturbances"	47CFR Part 15 Ref. Section 15.109
TEST REQUIREMENTS	TEST SETUP	CISPR Pub. 22 :1997
	TEST FACILITY	Anechoic chamber
	TEST DISTANCE	3 m
	LIMITS FOR RADIATED DISTURBANCES	47CFR Part 15 Ref. Section: 15.109 (a)
	FREQUENCY RANGE	30 MHz to 10° harmonic of highest w orking frequency
	DETECTOR	PEAK and AVERAGE
	IF BANDWIDTH	120 KHz (30 – 1000 MHz) 1 MHz (frequency > 1GHz
	NOTES: Broadband measurements with Quasi-Peak detector are performed only for frequencies which the Peak values are ≥ (Q.P. limit - 6 dB)	

TEST DATA	PORT UNDER TEST	OPERATING CONDITION	RESULT	NOTES
	Enclosure	#1	Within the limit	---

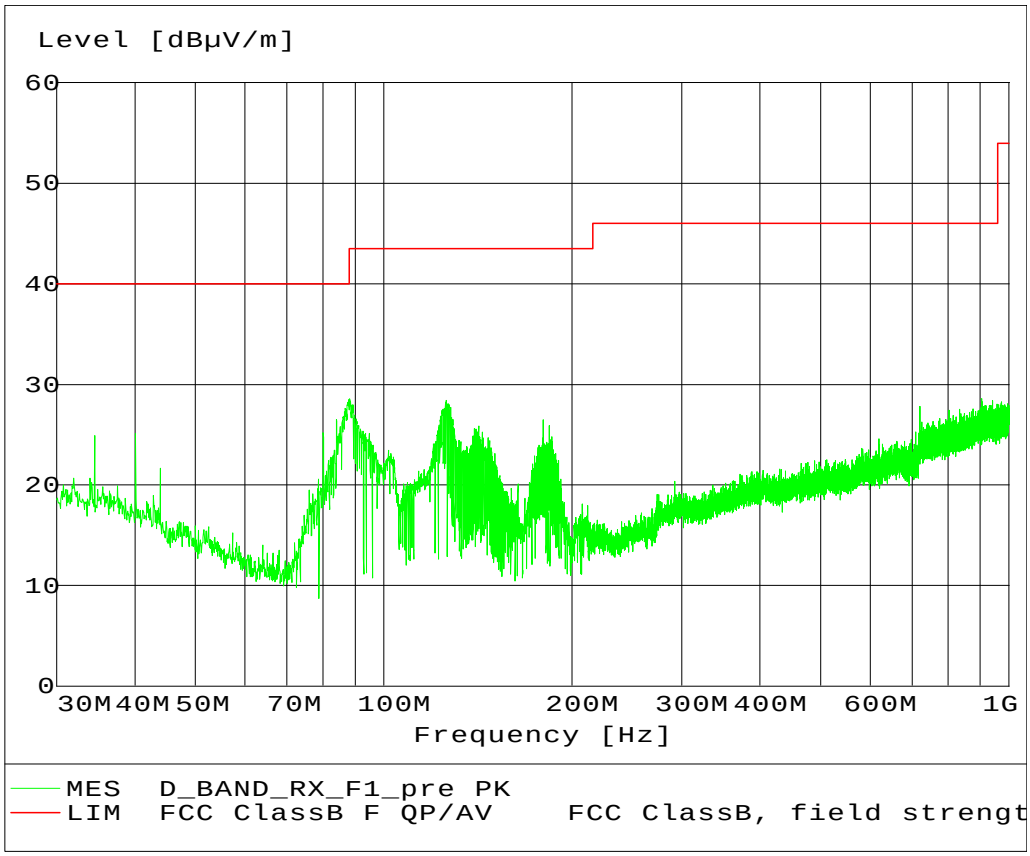
Modification during the test:

- None

MEASUREMENTS RESULTS

RADIATED DISTURBANCE AT ENCLOSURE PORT

Radiated emission 30 MHz – 1000 MHz



6 ADDITIONAL TECHNICAL INFORMATION

6.1 Electromagnetically relevant components:

Components	N°	Manufacturer	Type – Technical data
Radio Receiver	1	Aur.el	RX-AM4SF
Radio Receiver	1	Aur.el	RX-AM8SF
Microprocessor	1	MICROCHIP	PIC18LF6720/6722
16 MHz quartz	1	/	HC49S
4 MHz quartz	4	/	/

6.2 RFI SUPPRESSION DEVICES:

Components	N°	Manufacturer	Type – Technical data
Emi Suppression Filter For DC	1	Murata	BNX002-01

6.3 EMI PROTECTION DEVICES:

Components	N°	Manufacturer	Type – Technical data
Varistor	1	/	CT1210K25G

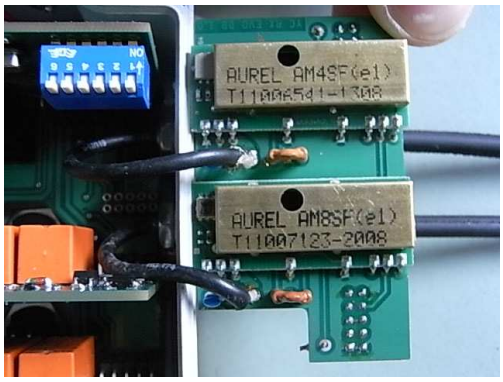
7 TECHNICAL DOCUMENTATION

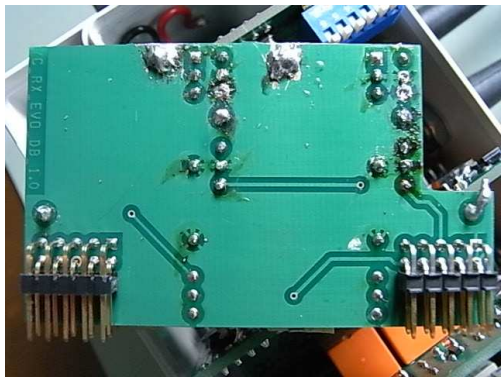
DOCUMENT	REFERENCE
Manuale Installatore	I-EVODB-Inst
Manuale utilizzatore	I-EVODB-Uti
Wiring Diagrams	CPU_RX per EVO e DIVO Versione 2 – Rev. 3.1 ADP_RX_EVO-DB – Rev. 1.0 Modulo di commando di uscita eliche e verricello per YC_EVO – Rev. 3 Scheda base per ricevitore YC per EVO e DIVO – Rev. 2.1 MODULO_OUT_MOTORI_EVO_3W – Rev. 1.0
Bills of materials	CPU_RX per EVO e DIVO Versione 2 – Rev. 3.1 – December 02, 2009 ADP_RX_EVO-DB – Rev. 1.0 – May 25, 2009 Modulo di commando di uscita eliche e verricello per YC_EVO – Rev. 3 – December 02, 2009 Scheda base per ricevitore YC per EVO e DIVO – Rev. 2.1 – June 04, 2009 MODULO_OUT_MOTORI_EVO_3W – Rev. 1.0 – May 28, 2009

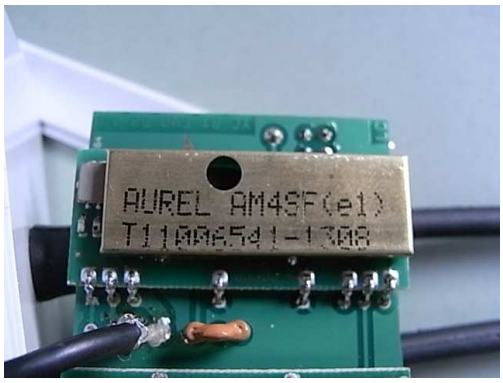
8 PHOTOGRAPHIC DOCUMENTATION

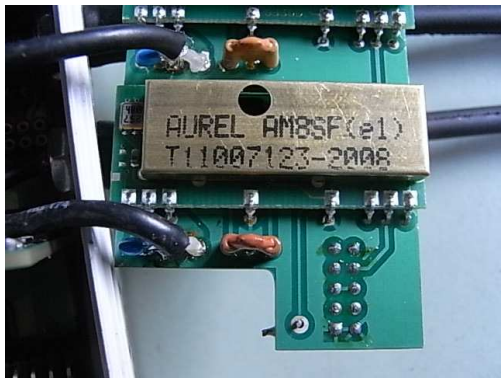
8.1 EUT IDENTIFICATION

Equipment under test identification

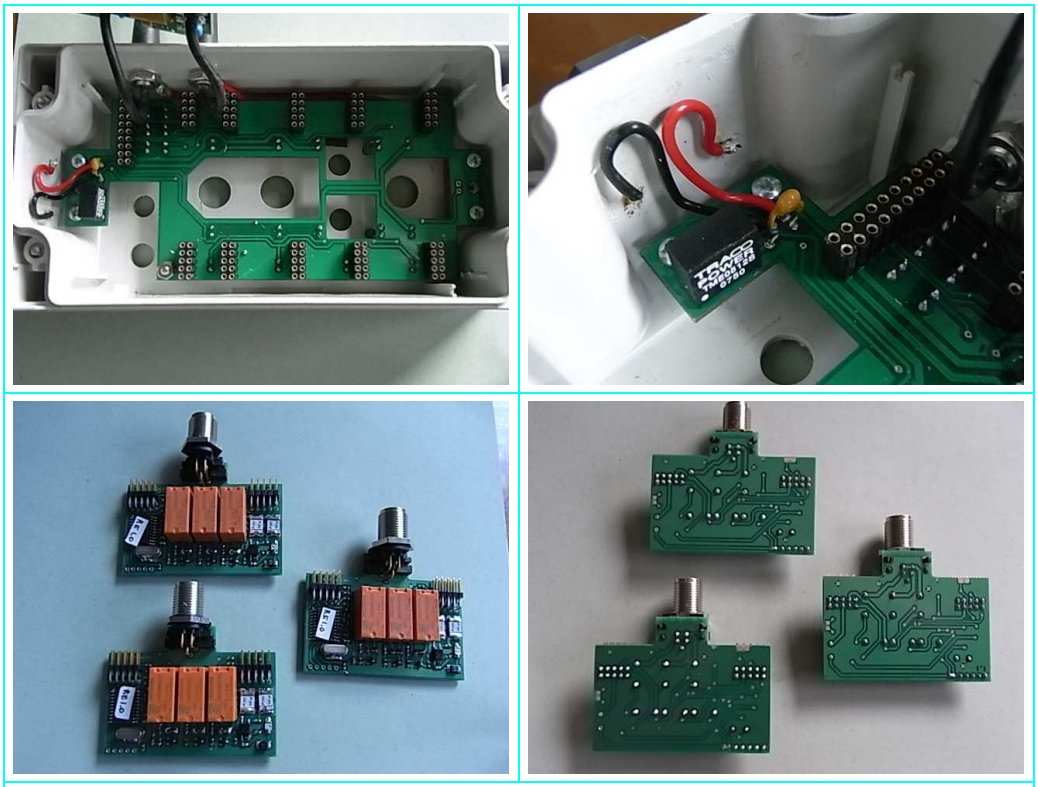




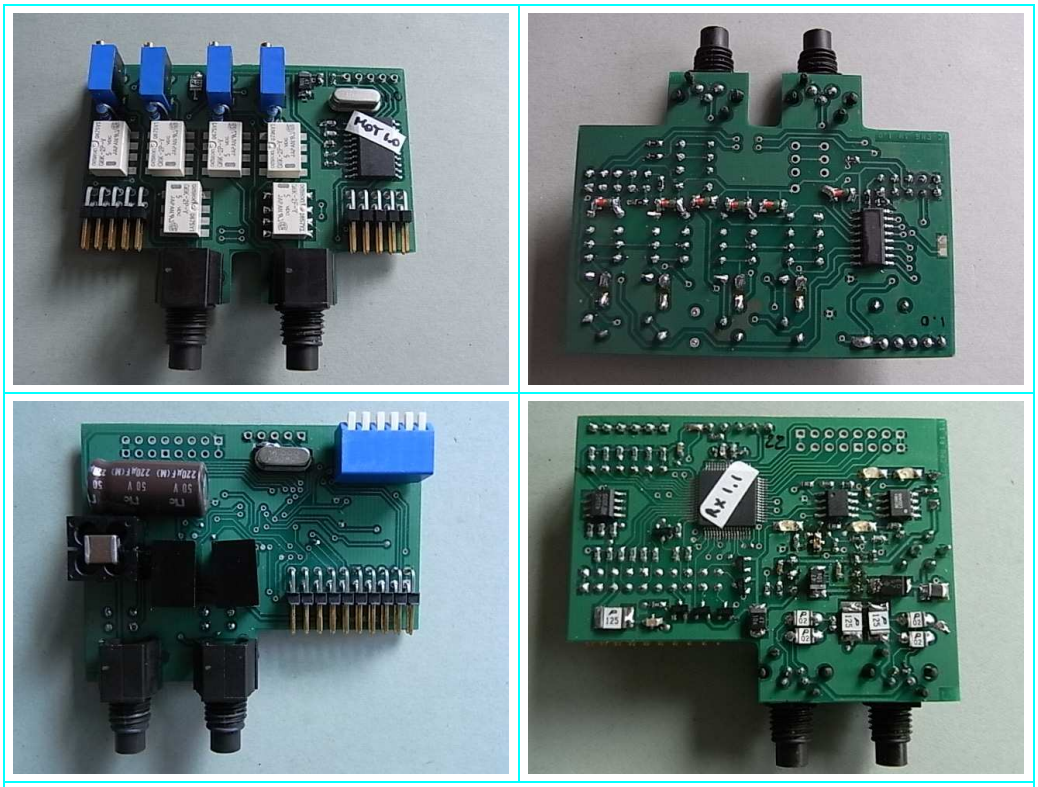




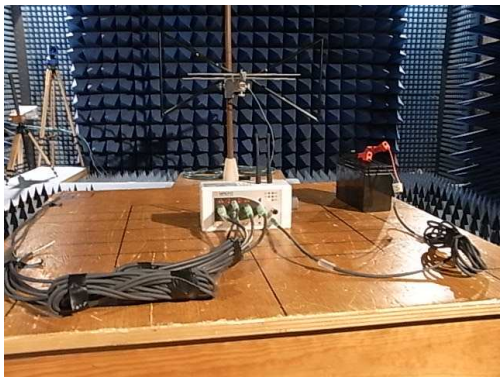
433,92 & 868,30 MHz Receiver modules and antenna

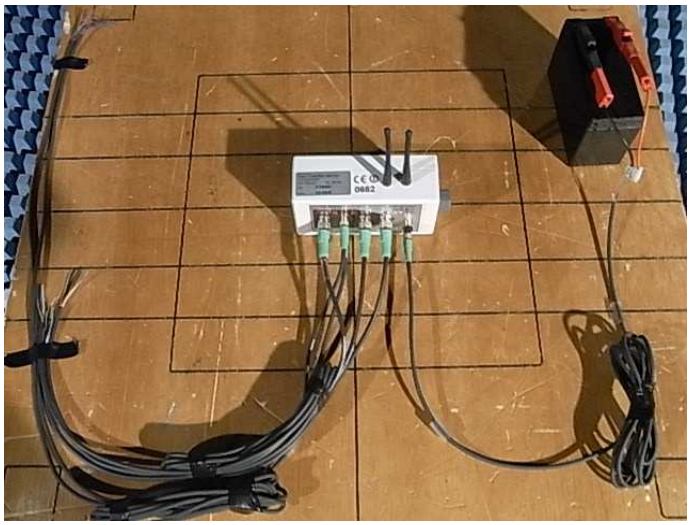


Other modules on receiver unit



Other modules on receiver unit





Set-up of radiated emission test

9 MEASUREMENT AND TEST EQUIPMENT

INSTRUMENTS	MANUFACTURER	MODEL	IMQ s/n
EMI receiver	Rohde & Schwarz	ESVS10	S-04197
Log-periodic antenna	ARA	LPE-2520/1	S-03511
Shielded anechoic chamber	SIDT EUROPE	/	P-02386
PC and SW for test automation	/	/	/